CLAIMS:

1. A method of monitoring erosion of a system component in a plasma processing system, the method comprising:

exposing a system component having a gas emitter to a plasma process; and

monitoring the plasma processing system for release of a sensor gas from the gas emitter during said process to determine erosion of the system component.

2. The method according to claim 1, wherein said exposing comprises exposing a consumable part to said process.

3. The method according to claim 1, wherein said exposing comprises exposing at least one of a ring, a shield, an electrode, a baffle, and a liner to said process.

4. The method according to claim 1, wherein said monitoring comprises monitoring at least one gas having fluorescent properties when excited by a light produced in the plasma.

5. The method according to claim 1, wherein said monitoring comprises monitoring at least one gas having fluorescent properties when excited by excited gas species produced in the plasma.

6. The method according to claim 1, wherein said monitoring comprises using an optical monitoring system to detect fluorescent light emission.

7. The method according to claim 6, wherein said monitoring further comprises determining if the intensity level of the fluorescent emission exceeds a threshold value.

8. The method according to claim 7, wherein said monitoring further comprises identifying the system component from a detected wavelength of the fluorescent light emission.

9. The method according to claim 7, wherein said monitoring further comprises measuring an intensity level of the fluorescent emission to arrive at a determination of whether the component needs to be replaced, and based on the determination, either continuing with the process or stopping the process.

10. The method according to claim 1 wherein said monitoring comprises using a mass sensor to detect a mass signal.

11. The method according to claim 10, wherein said monitoring further comprises determining if an intensity level of the mass signal exceeds a threshold value.

12. The method according to claim 10, wherein said monitoring further comprises identifying the system component from the mass signal.

13. The method according to claim 10, wherein said monitoring further comprises measuring an intensity level of a mass signal to arrive at a determination of whether the component needs to be replaced, and based on the determination, either continuing with the process or stopping the process.

14. The method according to claim 1, wherein said monitoring comprises monitoring for release of at least one of He, Ne, Ar, Kr, Xe, N_2, O_2, NO, and N_2O.

15. A method of monitoring system component status in a plasma processing system, the method comprising:

exposing a system component having a gas emitter to a plasma, wherein the gas emitter contains a sensor gas capable of fluorescent light emission when released from the gas emitter and exposed to the plasma; and

monitoring fluorescent light emission from the plasma processing system during a process, the monitoring including using an optical monitoring system to detect a wavelength and an intensity level of the fluorescent light emission, identifying the system component from the wavelength of the fluorescent light emission, and arriving at a determination of erosion level of the system component.

16. A method of monitoring system component status in a plasma processing system, the method comprising:

exposing a system component having a gas emitter to a plasma, wherein the gas emitter contains a sensor gas; and

monitoring a mass signal from a sensor gas in the plasma processing system during a process, the monitoring including using a mass sensor to detect the mass signal and an intensity level of the mass signal, identifying the system component from the mass signal, and arriving at a determination of erosion level of the system component.

17. A plasma processing system, comprising:

a plasma processing chamber;

a plasma source configured to create a plasma from a process gas;

a system component having a gas emitter, wherein the gas emitter contains a sensor gas;

a monitoring system configured to monitor for the release of the sensor gas from the gas emitter to determine erosion level of the system component; and

a controller configured to control the plasma processing system.

18. The system according to claim 17, wherein the system component comprises a consumable part.

19. The system according to claim 17, wherein the sensor gas comprises at least one gas having fluorescent properties when excited by a light produced in the plasma.

20. The system according to claim 17, wherein the sensor gas comprises at least one gas having fluorescent properties when excited by excited gas species produced in the plasma.

21. The system according to claim 17, wherein the monitoring system comprises an optical monitoring system for monitoring fluorescent light emission from the plasma processing chamber during processing.

22. The system according to claim 17, wherein the monitoring system i comprises a mass sensor for monitoring a mass signal from the plasma processing chamber during processing.

23. The system according to claim 17, wherein the system component comprises at least one of a ring, a shield, an electrode, a baffle, and a liner.

24. The system according to claim 17 wherein the system component comprises at least one of silicon, quartz, alumina, carbon, silicon carbide, aluminum, and stainless steel.

25. The system according to claim 17, wherein the system component further comprises a protective barrier.

26. The system according to claim 25, wherein the protective barrier comprises at least one of Y_2O_3, Sc_2O_3, Sc_2F_3, YF_3, La_2O_3, CeO_2, Eu_2O_3, DyO_3, SiO_2, MgO, Al_2O_3, ZnO, SnO_2, and In_2O_3.

27. The system according to claim 17, wherein the plasma source comprises an inductive coil.

28. The system according to claim 17, wherein the plasma source comprises a plate electrode.

29. The system according to claim 17, wherein the plasma source comprises at least one of an ECR source, an ESRF source, a microwave device, a Helicon wave source, and a surface wave source

30. A plasma processing system, comprising:

a plasma processing chamber;

a plasma source configured to create a plasma from a process gas;

a system component having a gas emitter, wherein the gas emitter contains a sensor gas capable of fluorescent light emission when exposed to a plasma;

an optical monitoring system for monitoring light emission from the plasma processing chamber during processing to monitor erosion level of the system component, wherein the optical monitoring system is further configured to identify the system component from awavelength of the fluorescent light emission, to determine if an intensity level of the fluorescent emission exceeds a threshold value, to determine if the system component needs to be replaced, and based on the determination, either continue with the process or stop the process; and

a controller configured to control the plasma processing system.

31. A plasma processing system, comprising:

a plasma processing chamber;

a plasma source configured to create a plasma from a process gas;

a system component having a gas emitter, wherein the gas emitter contains a sensor gas;

a mass sensor for monitoring a mass signal from the plasma processing chamber during processing to monitor erosion level of the system component; wherein the mass sensor is further configured to identify the system component from the mass signal, to determine if an intensity level of the mass signal exceeds a threshold value, to determine if the system component needs to be replaced, and based on the determination, either continue with the process or stop the process; and

a controller configured to control the plasma processing system.

32. A monitorable consumable system component, comprising:

a system element that is consumed during processing performed by the system; and

a gas emitter containing a sensor gas coupled to the system element.

33. The consumable system component according to claim 32, wherein the sensor gas is capable of fluorescent light emission when exposed to a plasma.

34. The consumable system component according to claim 33, wherein the light emission is used to monitor erosion level of the system component.

35. The consumable system component according to claim 32, wherein a mass signal is used to monitor erosion level of the system component.

36. The consumable system component according to claim 32, wherein the system element comprises a ring, a shield, an electrode, a baffle, or a liner.

37. The consumable system component according to claim 32, wherein the system element comprises a focus ring.

38. The consumable system component according to claim 32, wherein the system element comprises an electrode plate.

39. The consumable system component according to claim 32, wherein the system element comprises a deposition shield.

40. The consumable system component according to claim 32, wherein the system element comprises at least one of silicon, quartz, alumina, carbon, silicon carbide, aluminum, and stainless steel.

41. The consumable system component according to claim 32, wherein the gas emitter is fully encapsulated by the system element to provide a

closed volume that contains a fixed amount of sensor gas within the gas emitter .

42. The consumable system component according to claim 32, wherein the light emission from the sensor gas allows for identifying the consumable system component.

43. The consumable system component according to claim 32, wherein a mass signal from the sensor gas allows for identifying the consumable system component.

44. The consumable system component according to claim 32, wherein the sensor gas comprises at least one of He, Ne, Ar, Kr, Xe, N_2, O_2, NO, and N_2O.

45. The consumable system component according to claim 32, wherein the system component further comprises a protective barrier.

46. The consumable system component according to claim 45, wherein the protective barrier comprises at least one of Y_2O_3, Sc_2O_3, Sc_2F_3, YF_3, La_2O_3, CeO_2, Eu_2O_3, DyO_3, SiO_2, MgO, Al_2O_3, ZnO, SnO_2, and In_2O_3.

47. The consumable system component according to claim 32, further comprising a gas supply line configured to connect said gas emitter to a sensor gas source that supplies said sensor gas to the gas emitter.

48. The method according to claim 1, wherein said monitoring comprises monitoring for release of a fixed amount of said sensor gas contained in an enclosed volume of said gas emitter.

49. The method according to claim 1, wherein said monitoring comprises monitoring for release of said sensor gas from said gas emitter, said supply of sensor gas being supplied from a gas source to said gas emitter.

50. The system according to claim 17, wherein said gas emitter comprises a closed volume that is fully encapsulated within said system component to contain a fixed amount of sensor gas within the gas emitter.

51. The system according to claim 17, further comprising:

a sensor gas source configured to provide a supply of said sensor gas; and

a gas supply line configured to connect said gas emitter to said sensor gas source in order to supply said sensor gas to said gas emitter.